Petroleum Today

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SOVIET OIL BOOM

Gasoline Dresses for the Weather

A Pipe Dream Come True

The Christopher Columbus of the Oil Fields

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COVER COMMENT

The 100th anniversary of the petroleum industry was observed during 1959 by a variety of public events. Among centennial year activities was the Oil Capital Art Show, sponsored by the Petroleum Industry Committee of the Chamber of Commerce of Tulsa, Okla.

Mrs. Ruth Finley's painting, "Setting Pipe," which is reproduced on our cover, was one of the prize winners in this exhibit of 73 paintings. It depicts a drilling rig where the crew is engaged in lining the well prior to going into production.

The photograph on the inside back cover is the product of a photography contest sponsored by the Massachusetts Petroleum Council in connection with its centennial celebration.

Soviet Oil Boom

RUSSIA'S OIL PRODUCING AREAS, REFINING CENTERS AND PIPELINE ROUTES

Soviet Oil Boom

by Thomas P. Whitney

On the treeless steppes between the Volga River and the Ural Mountains, Soviet oil rig crews live rugged lives. Their assigned goal: surpass the U. S. in oil output. The Kremlin has given top priority both to building up reserves and increasing production, and is basing its industrial challenge to the U. S. primarily on energy from petroleum.

IVAN PAVLOV, who bosses a drilling rig in the new Kuleshovka field, is known for his skill among roughnecks of the entire Volga-Urals area, which is now the USSR's number one oil basin.

A half-dozen rigs work day and night in the new oil field, near a silvery lake, on the empty, flat steppe in the heart of the Eurasian continent.

"We're fighting not only for hours but for minutes as well," Pavlov will tell you. There are several reasons why, as he says, "we can't slow down." One of the most important is the fierce competition between Pavlov's crew and the crew on another rig bossed by a woman engineer, whose name happens to be Ulanova, the same as Russia's famous ballerina. Pavlov would become the laughingstock of the oil field if he were to lose his laurels to a woman.

Pavlov would also tell you something that's drummed into the minds of nearly everyone in Russia's booming oil industry: The Soviet Union has resolved to overtake the United States in oil production.

Drilling crew rivalry and patriotism go hand in hand, but an even more important reason not to slow down is plain material incentive. Oil-well drillers are paid on the basis of incentive rates which give them big bonuses when they exceed the goals set for them by their superiors. This is but one of the ways the Soviet government favors the petroleum industry, which it regards as a pillar of its military-economic capabilities. To be sure, a Soviet oil-field worker's wages even in the very highest bracket, when measured in their purchasing power, are no match for the earnings of his American counterpart. But in Soviet terms they are a strong incentive.

Special incentives keep talented men like Pavlov and other drilling rig foremen such as V. F. Stavropoltsev, who is working Well No. 51 at Kuleshovka, and V. A. Ulanova, Pavlov's female rival, on the job and working efficiently. They live, like many oil workers in Russia, in a primitive area under far-from-ideal conditions.

The 44 aluminum-painted portable shacks with stovepipes sticking out of them that line the only street in Kuleshovka are neither comfortable nor spacious. The street is not paved and turns to mud when it rains or thaws.

Kuleshovka is connected with the outside world mainly by plane. An average of 17 aircraft a day bring in food, equipment and workers. Since the drillers' families all live 60 miles away in an older settlement, the workers are flown home and then back whenever they have leaves. So far there is no road to Kuleshovka. There's no pipeline either, and the new wells are all capped for the present.

Kuleshovka is only one—the most promising—of 16 new fields found in the Kuibyshev region this year. Kuibyshev is the third largest producing region in the country, trailing both the neighboring Tatar and Bashkir Republics.

Thomas P. Whitney, *now a free-lance writer, spent nine years in Moscow after World War II as Chief of the Economic Section of the U. S. Embassy and as a staff correspondent for the Associated Press.*

AMERICAN oil experts know that in both oil production and technology the Soviet Union is a leading and rapidly rising power.

The Russians have had long experience in petroleum. Extraction and use of crude oil in territory now a part of the Soviet Union is known to go back to ancient times. Alexander the Great, when he marched through northern Persia, is said to have been given lamps filled with crude oil. No doubt this oil came from surface seepages, common on the Apsheron Peninsula which is part of contemporary Baku. Marco Polo mentions Baku oil in the story of his travels. Archeologists have established that there was a brisk trade for centuries in Baku oil, believed at the time to have miraculous curative powers. In 1735 a Russian scholar visiting the Baku area found some 50 hand-dug pits from which crude oil was being lifted in leather buckets.

Russia, however, trailed the United States in drilling for oil. Col. Edwin L. Drake drilled the first commercial oil well at Titusville, Pa., in 1859, but it was not till 1873 that Russian entrepreneurs in Baku initiated quantity production. The oil boom which followed eventually saw Russia take first place in world oil production and exports in the years from 1898 to 1901. Most of Russian production was concentrated in Baku.

Baku was a wild town in those days. Russian and foreign capitalists fought over concessions and leases. Fortunes were made and lost overnight. Well derricks sprang up so close in places that their bases touched each other. Russians, Armenians, Georgians, Ukrainians, Tatars and other workers swarmed to Baku in search of jobs. The native Azerbaidjanians—a Turkish people — were left a minority in their own city. There were bitter conflicts among the many nationalities. The city's population multiplied by seven times between 1863 and 1897. Many workers and their families lived in unbelievable filth and squalor. Lawlessness prevailed Work methods were crude and accidents and deaths among workers were very common. Atrocious sanitary conditions existed and epidemics were frequent.

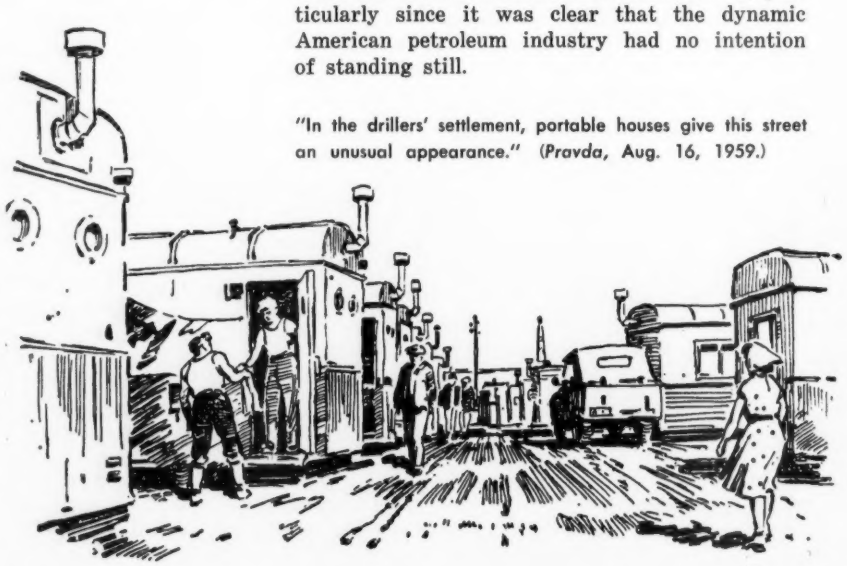
Alongside enormous wealth there was extreme poverty, made to order for the Russian revolutionaries. Many communist leaders, including Joseph Stalin, got their training in organizing strikes and disorders in the Baku oil fields.

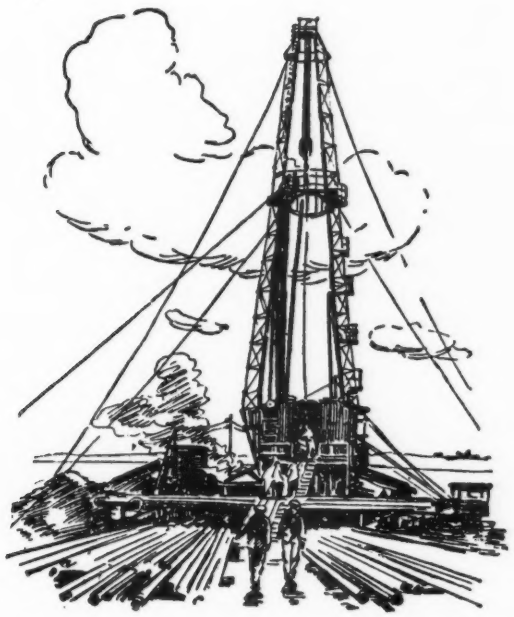
Russia's turn-of-the-century lead in oil was short-lived. Between 1901 and World War I, Russian output dipped while American production soared. The Russian civil war from 1918 to 1921 devastated the country's oil fields and long years were required to recover. Even the most ruthless, totalitarian methods of the Communist dictatorship barely succeeded in quadrupling Soviet production during the five-year plans from 1928 to 1941 as compared to 1913. Then came the difficult times of World War II. Several smaller Soviet fields were devastated by the Germans, and Baku and other uninvaded areas suffered severely from lack of pipe and transport troubles.

But worst of all for the Russians, it was during World War II that it finally became apparent that the Baku fields were finished once and for all as a growth area. They had been producing under highly predatory methods of exploitation on a large scale for 70 years and by 1940 their future was dim.

By 1946 the United States was outproducing the Soviet Union by 11 times. This seemed to constitute an insurmountable American lead, particularly since it was clear that the dynamic American petroleum industry had no intention of standing still.

"In the drillers' settlement, portable houses give this street an unusual appearance." (*Pravda*, Aug. 16, 1959.)





"In the steppe there has appeared one more rig. Here the crew of Foreman I. M. Pavlov is drilling." (*Pravda* Aug. 16, 1959.)

HOW can it be that now, only 14 years later, Soviet political leaders can talk of catching up with and surpassing the United States in oil production—and that their words are being taken seriously in America by experienced oilmen?

The answer is threefold: a rich new oil basin, highly promising new drilling techniques, and lavish state support in huge capital investments and high priorities.

Long before the Second World War some leading Soviet oil geologists had been urging the government to develop oil deposits which, they claimed, lay between the Volga River and the Ural mountains. For a long time there was much talk about this but almost no action at all. The government undertook some exploratory work but continued to concentrate nearly all its drilling activity in Baku and other older proven oil basins. It took World War II to shake the bureaucrats out of their lethargy. With a desperate need for oil and the Caucasus in danger of being cut off entirely, the decision was made to gamble on a quick increase in production in the Volga-Urals area.

The gamble paid off from the outset. Fields were found in Devonian deposits and other strata in the Kuibyshev Region, the Tatar Republic and the Bashkir Republic. These got started as important producing areas during wartime. Their output has been rising year after year ever since. By 1958 the Volga-Urals basin produced over two-thirds of all Soviet oil—almost three times as much as all the oil fields of the Caucasus taken together at the peak of their production. The Volga-Urals finds unquestionably rank among the greatest strikes in oil history and have put Russia back on the world oil map in a big way.

Intense search for new oil deposits continues, particularly in Siberia and Central Asia. Soviet Minister of Geology, Pyotr Antropov, who directs all oil exploration in Russia, recently made the startling claim that Soviet Central Asia, not hitherto considered a major oil basin of the world, has bigger reserves than the entire Near and Middle East. This is an astonishing statement, but it remains to be proven.

IT is never enough, of course, just to find oil. The crude has to be gotten out of the ground, and Soviet technology is more than equal to the task.

Highly advanced methods of drilling are being used in exploitation of the Volga-Urals basin. Foremost Russian development is the turbodrill—a drill propelled by built-in turbines driven by drilling mud. The turbodrill, long under development in the West but never perfected, is now employed in nine-tenths of Soviet drilling. It has provided a rare instance of U. S. seeking Soviet technical know-how, for one domestic company has obtained a patent on the Soviet device.

Russian oil experts are currently experimenting with slim hole drilling to economize on cement, steel and other materials. In Bashkiria, they have introduced electric drilling in depths below 7,000 feet. One type of electrodrill being tested has a motor as part of the drill stem and another is a tubeless type or wireline unit.

BETWEEN 1945 and 1959, Soviet oil output grew more than seven times. Output of gas, of which there was virtually no production prior to World War II, increased an estimated 12½ times in the same period. Over the last ten years oil production has risen by about 15 per cent per year. Even though American oil output also has risen considerably since World War II, the Russians have narrowed American superiority from 11 to 1 down to about 3 to 1. This is still quite a gap but the Soviet leaders plan to close it fast.

In 1958 the USSR produced 2.3 million barrels of crude a day compared to 6.7 million in the U. S. The Soviets plan to raise output to 2.9 million in 1960, to from 4.6 to 4.8 million in 1965 and to from 7 to 8 million in 1972.

It must be remembered, however, that American oil companies could increase domestic output by another three million barrels a day if demand warranted. State proration laws limit U. S. production in the interest of conservation. Thus, the U. S. has a greater production capacity than it is using at any given time, while the Soviet Union is undoubtedly producing at its fullest capability.

In view of these comparative production figures, it is difficult to see how the Kremlin can justify setting 1972 as the target year for surpassing the U. S. Moreover, the Soviet boast ignores projected increases in American demand. By 1975, it has been estimated the U. S. will require a daily production of about 14 million barrels, or twice the rate the Soviets hope to reach by 1972.

On the other side of the ledger it must be noted that the USSR has the great advantage of still possessing large deposits at relatively shallow, easy-to-reach levels, whereas oil is becoming progressively more difficult and costly to find in the United States.

There is reason, therefore, to be concerned over ways to encourage the search for new U. S. deposits. For, while the Kremlin can arbitrarily allot so many millions of rubles for exploration, the extent of oil prospecting in the U. S. is governed by what competing private investors can finance themselves, against high odds.

THE spectacular post-war increase in USSR oil and gas production will be accelerated under the new 1959-65 seven-year plan. Signalling an historic shift in the Soviet energy pattern, the plan calls for doubling oil output and increasing natural gas production fivefold in seven years. The role of coal will be reduced drastically. Whereas in 1958 coal provided 58 per cent of the Soviet energy needs, it will be supplying only 42 per cent by 1965. During the same period the share of oil and gas is due to rise from 31 per cent to 50 per cent or more. Oil and gas are now the favored energy sources because they cost less per heat unit to produce, require less labor, and are easier to handle, transport and use.

One example of the drastic shift: Presently coal meets 85 per cent of the fuel required by Soviet railroads. By 1965, coal will supply only 11 per cent, with oil taking over most of the burden.

ANOTHER significant consequence of Russia's petroleum boom could well be a marked increase in oil exports. Immediately after World War II the Soviet Union had to import oil. Beginning in 1950 exports were resumed on a small scale and have risen steadily ever since. In 1958 they amounted to 16 per cent of output or 360,000 barrels a day, of which about 200,000 barrels entered Free World markets. Thus, Russia again ranks, for the first time in more than two decades, as an important oil exporter.

Predictions are for a considerable increase in sales abroad in coming years. Rapidly rising crude

Mariya Ivanovna — Moscow

Mariya Ivanovna is a stolid, tired-looking woman of about 45 who wears a dark gray shawl over her head and a sort of khaki apron.

She used to help me a few years ago to get gasoline—benzine, as the Russians call it—at a desolate gas station down near the Moscow River at the bottom of a deeply-rutted and steep little side street off the Garden Boulevard.

Altogether there were half a dozen hand pumps there and self-service was usually the order of the day. Mariya Ivanovna or one of her fellow station attendants, much like her, used to wander over and I would give her my coupons. Gas rationing was still in effect at the time and coupons, each good for 10 liters (about 2½ gallons), had to be obtained from an authorized official agency of the government.

The ancient old pumps gurgled and bubbled much like those I can remember in America in rural areas in my boyhood in the late twenties. I had to take half my ration in a type of "benzine" called "B-70." The "70" presumably was supposed to stand for the octane rating—which was, I am sure, actually closer to 50 than 70. The other half I received in gasoline that supposedly was near 100 octane in rating.

There was always the problem of trying to balance the cheaper gas in the tank with the better so as to get a passable mixture. And you could never be quite sure whether you could get another

production, more or less chronic failure of refining capacity to keep pace with output, unwillingness of the Soviet government to have a private automobile and private home economy develop in the USSR, and other factors suggest that Russia will have export surpluses of increasing size in coming years. It is relevant that pipelines are now envisioned to carry Volga-Urals oil into Eastern Europe. It is only one step farther to the markets of Western Europe. Soviet exports, however, are often dependent on political considerations and they cannot be predicted solely on the basis of economic logic.

TO transport and process increased output the USSR is creating a big pipeline system and a big refining industry. The Russians are aware of the advantages of pipeline transport and are building oil and gas lines as fast as they can, but they can't build them fast enough. As of 1958 about 40 per cent of the crude oil and products moved via pipeline. Most significant accomplishment has been the Siberian line completed nearly to Lake Baikal. Since there is no production at all between the Urals and Sakhalin Island in the Pacific, Siberia's dependence on long-haul oil is acute. Until the pipeline went into operation, the fast developing Soviet hinterland was at the mercy of uncertain rail transport of petroleum.

In refining, the tendency has been to move processing centers away from producing centers, where they used to be located, and into principal consuming areas. Soviet petroleum processing, however, does not seem to be nearly so well advanced technologically as Soviet drilling.

IT is characteristic of present Soviet policy that industry and transport—rather than the consumer—are to be the chief beneficiaries of increased oil output.

The U. S. oil industry, though also serving industry and government, is primarily oriented to the individual citizen's needs—the more than 58.5 million car owners, the more than 9.5 million households equipped with oil burners, the owners of outboard motors, power lawn mowers, and the dozens of other gasoline-powered conveniences that help make the American way of life more versatile and personally rewarding.

By sharp contrast, the average Soviet citizen is hardly aware of an oil industry. The number of private cars in the Soviet Union is fantastically small for the size of the population. (Output in 1958 was only 122,000 as compared to 4,258,000 in the U. S.) Moreover, Premier Nikita Khrushchev recently served notice on the Soviet public that private car ownership will not be encouraged. There are no oil burners in Russian private homes and, for that matter, home ownership itself is not particularly favored by the state.

The current Soviet oil boom, therefore, will be of paramount significance in the industrial competition between the United States and the Soviet Union in the years ahead. And, that's why Ivan Pavlov, Ulanova, and the others are among the hero workers of the Soviet Union. They are the ones who will enable the Soviet Union to challenge the Free World on the energy front.

w gasoline station attendant

10 liters into the tank or whether precious quarts of it would spill out onto the ground.

The average price was—and still is—around a ruble a liter, roughly equivalent to 40 cents a gallon at the tourist exchange rate of 10 rubles to the dollar. Although price has but little meaning when government-dictated as in the Soviet Union, this is about double the average price of a gallon of U. S. gasoline excluding taxes.

In the middle of the station area, paved with cinders, there was one dirty little building where the station attendants would keep the coupons they collected and find shelter from storms and cold. No oil sold. No bright sign lighted. No facilities for car washing or lubrication. No windshield cleaning. No credit cards. No soft drink dispensers. No tires for sale out in front nor auto accessories and appurtenances inside. No road maps. No rest rooms. Just gasoline—and Mariya Ivanovna.

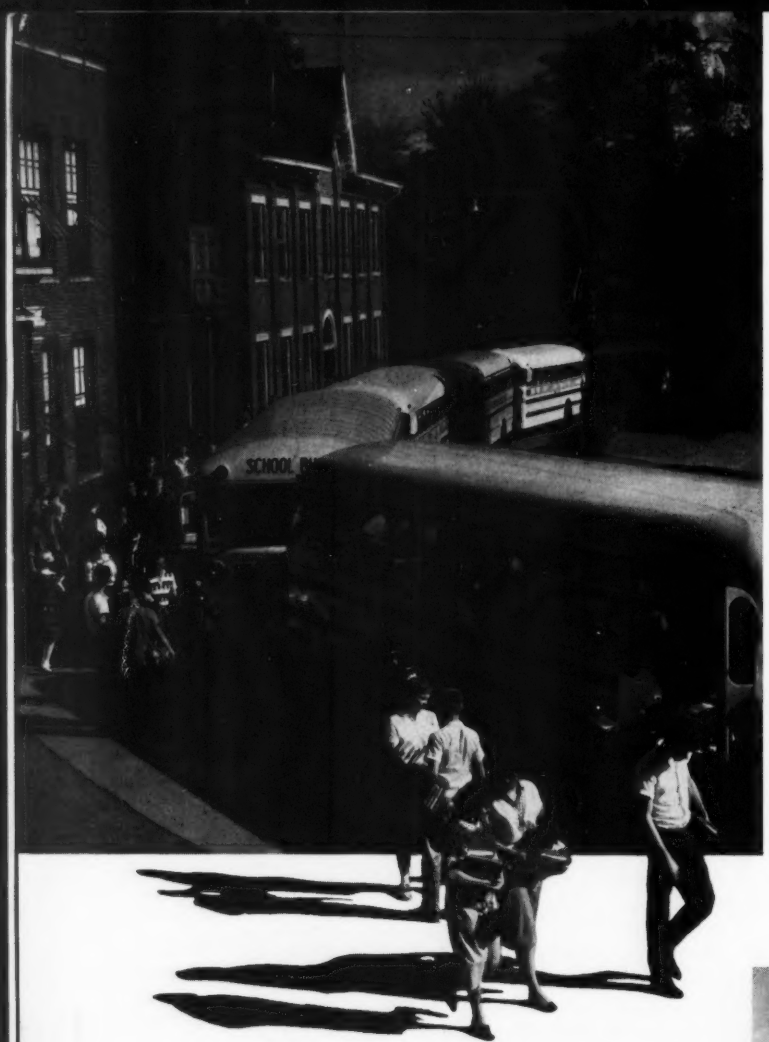
This old station has disappeared to make way for a bridge. But there's another rather like it not far away still operating. And there are other stations in Moscow today not so very different.

But, in all fairness, it must be noted that some fancier, better equipped stations have made their appearance in the past few years. And out in the country on the main tourist highways there are a few showpieces—genuine service stations where one can find most anything a motorist will need, including courtesy.

HAVE BOOKS

SIX times a day, throughout the school year, Joe Gable maneuvers his long, yellow, 72-passenger bus into a school driveway to load or unload children.

Joe Gable's bus is one of a fleet of 29 operated by the West Clermont School District in Clermont County near Cincinnati in southwestern Ohio. These 29 buses make 184 trips a day, transporting 4,500 students or almost the entire student body. Kindergartens and half-day sessions for the first two grades of this crowded school district keep the buses in operation from 7:05 a.m. until 5:25 p.m.



Oblivious of the waiting driver, bobby-soxers and crewcut teen-agers say their after-school goodbyes.

A honey-haired little girl eagerly boards the bus with a note for her teacher pinned conspicuously to her dress.

With another day of school over, the youngsters head for homeward-bound buses.

WILL TRAVEL!

"Our buses," says Robert Goforth, West Clermont assistant superintendent in charge of transportation, "travel 2,081 miles a day. It costs us about 25 cents a mile to operate them or around $93,000 a year."

No driver on the road has a greater responsibility than the one behind the wheel of a school bus. Ohio is one of the states that requires a special driver fitness test for a license. It also requires that school bus drivers be over 21 years of age. Two of the 36 drivers who work for the West Clermont District are women and the average age of all the drivers is about 40.

School buses comprise one of the country's biggest and most vital transportation systems. In one year, 159,764 school buses hauled more than ten million children to the public schools alone. The cost of operating this fleet of buses comes to $356 million.

The nation's critical shortage of adequate classroom facilities has enhanced the role of the school bus. For, when hard-pressed communities pool their resources to construct consolidated school district buildings, transportation becomes a vital consideration.

A bus driver has to fill a gap between mother and teacher for the little ones. Tying a shoestring is one of the easier services he performs.

A load of high-spirited kindergarten children makes for a lively bus trip.

Perhaps one or two students use bus-riding time for homework, but for these debarking teen-agers it looks like the end of a very sociable trip.

The scooter goes to work

by Gardner Soule

MOTOR scooters, now primarily a teen-age mode of transportation, may well become jacks-of-all-trades in the workaday world.

The trend toward non-recreational uses of the scooter is admittedly marginal today, but nonetheless promising. Already, for example, foot-weary postmen in 30 cities are using scooters. "That mail bag used to be a sad sack," recalls one carrier. "But now I'm riding in style," he beams, pointing to his three-wheel model enclosed against the elements.

One municipality has lady cops scootering around checking parking meters and performing other traffic chores; and regular policemen, whose flat feet are legendary, have been equipped with scooters for traffic patrol duty in several cities.

Mail delivery

Traffic policing

Commuting

As a "horizontal elevator," the scooter serves industry as a means of getting personnel and parts from one place to another at sprawling industrial installations, construction sites, airports and terminals. Scooter-borne cowboys even ride herd on cattle at one Texas stockyard.

Scooters already have become familiar light delivery vehicles in busy Manhattan and are making their debut in other traffic-congested cities over the country.

They have been on the golf course for some time. Latest models are three-wheelers that carry a caddy-chauffeur, six golfers and their gear.

Another fast-growing pack of scooter fans is to be found among those unsung heroes of modern society—the harassed commuters. Some have embraced scootering to save walking to the station; others to save mother two daily chauffering trips in the family car; and still others just because it adds a touch of adventure to the daily routine and thereby provides a conversation piece on the train.

"In a prosperous nation," says one of the leading U. S. scooter manufacturers, "it's foolish to compete with the car. But, the market for something between the bicycle and the auto is going to be a big one."

About 300,000 motor scooters are now darting around in the cities, suburbs and rural areas of the U. S. Another 75,000 are expected to go on the road this year. Manufacturers and importers are already confident of getting annual sales up to 100,000. This would put a million scooters on the roads and streets of America sometime in the '60's.

The U. S. Armed Forces were really responsible for promoting the scooter. It was one of the many types of vehicles they took around the world and left behind when the war was over and Europeans pounced on those we left. Their low-cost and low-gasoline consumption had strong appeal for the thousands for whom the bicycle was the chief means of personal transportation. It wasn't long before the Europeans were making their own scooters and today there are two million in operation abroad.

A recent survey showed that about 70 per cent of the 300,000 scooters registered in the U. S. are owned by teen-agers and those in their early 20's. Most of these are two-wheel models. The three-wheelers are generally used for utilitarian puposes, rather than for personal transportation.

All told, there are 40 different models of scooters on sale in the U. S., both domestically manufactured and imported. Prices range from under $300 to $530 for two-wheel types and up to $1,100 for three-wheelers. Manufacturers contend that the two-wheel motor scooter operating costs are about the same as for a power mower. Scooters can get from 50 to 150 miles out of a gallon of gasoline.

As one scooter salesman put it, "We don't compete with the car but with shoe leather."

Oil Field Fables...

Swivel-Neck Luxury

The rotary drilling method of today was first introduced in 1901 in the famed Spindletop field which opened up Texas oil country. Cable-tool drilling declined in the ensuing two decades, although it is still employed in some operations even now.

When the Mexia field was discovered in Texas in 1920, it attracted hordes of workers from the declining Ranger field, which had been discovered in 1917 and was responsible for heading off a post World War I oil shortage.

Among the migrating workers were many cable-tool men, who found to their bitter disappointment that only rotary equipment was being used in the Mexia field. If they worked, they had to begin, with considerable loss of pay and status, as boll-weevils (a term applied to new men on a rig and derived from the fact that many of the "roughnecks" who manned the rotary rigs had been driven from cotton farms by the Mexican boll-weevil plague).

Needless to say, the cable-tool men had no love for the rotary men. One day some unemployed toolies walking down the street passed a window displaying the Rotary Club symbol. "Look," one of them said, "the damn swivel-necks even have a club."

False Alarm

When an oil company leased Tobe F's 120-acre farm in the Sulphur Bottom of East Texas, a bank was designated as his repository agent. The bank went broke and the company had to send a man to make payment in person.

He stopped at a country filling station to ask where Tobe might be found. The attendant pointed to a rusty model T turning off the highway. The oilman jumped in his V-8 and followed honking. But the T model didn't stop. It left the sandy trail and began dodging among pine trees, stumps and brush. It was well ahead when it pulled up at the back of a house.

The oilman arrived and knocked at the front door. It finally opened, and Tobe asked what he wanted. "I have come to tender you the $120 lease money."

Tobe threw his hat on the floor and stomped. "Here you been chasing me all over hell and half of Texas to give me some money and I just throwed two gallons of the best whiskey I ever made in the well." **Mody C. Boatright**

Like the tangled roots of a giant oak, the steel tubing twists its way beneath the land, bearing Machine Age energy into every corner of the nation.

This is the petroleum pipeline, a vast, unseen 205,000-mile network. It has spawned a unique breed of tough, courageous, imperturbable men. It has created a tradition of service and efficiency in the face of incredible difficulties.

Laurel Pipe Line is a part of that tradition.

A PIPE DREAM COME TRUE

by Robert W. Stock

Frank Love is a lean, curly-haired young pipeliner with thick calluses on his hands. He speaks with an authority and maturity beyond his years.

"Some kids live next to a railroad track and they want to be trainmen. I grew up by the pipelines."

Frank is learning his trade on the Laurel line, a $54-million bid to maintain economic oil product prices along the 447-mile route from Philadelphia to Cleveland. Laurel is the world's largest-diameter products line. Its automation equipment comes straight from the realm of science fiction. And the story of its construction ranges from the hilarious to the heroic.

In 1957, Laurel was nothing more than a set of blueprints. The closest Frank Love had come to pipelines was to watch them being worked over at his home in little Mount Union, Pa. At this stage the key man was Tony Corgiat, superintendent of rights-of-way. His job: to work with the property owners through whose land the line would go.

A pipeline is a common carrier, like the railroad. It serves a special and important function, recognized by the courts, in transporting vital goods to the public. As a common carrier, it is entitled to rights-of-way.

Tony is a dry, slow-talking veteran of 40 years in the oil business. His stock-in-trade is patience.

"I just explain the thing—tell 'em how much we pay and how we fix up the land just the same as before we went through. Most folks are understanding. We only had three jury trials for over 2,000 people we called on."

His task was no bed of roses, though. Residents naturally weren't too keen about having a construction job cutting across their back yards. "It takes tact and humility," says Tony, "specially with some of the women. I'll tell you, I'd rather deal with five men than one woman!"

Full scale construction was underway by summer of 1958. The task was enormous.

"We had two kinds of trouble," says Tom Shannon. He's a tall, husky, 41-year-old field engineer on the line. "Nature and people. I'd rather take on nature any time."

The construction of a pipeline sounds easy enough. Clear a path, dig a ditch, lay the pipe and cover it over. But there were complications. Laurel crosses seven rivers, one canal, 445 streams, 550 roads, untold city streets, 65 railroad tracks and the Allegheny Mountains. It ranges from sea level to 2,600 feet. Pennsylvania's Gov. David L. Lawrence calls the pipeline one of the most noteworthy engineering feats in the state's history.

In the mountains, bulldozers and tractors operated at grades close to the perpendicular. "Kind of separated the men from the boys," Tom says. "We had plenty of cat skinners on level land. Quit in flocks when they got one look at the mountains. Kind of easy to go rolling down the side if you don't know what you're doing."

Rock slides were another danger. "Men below just had to be on their toes, that's all. If we were looking for trouble, we could have got excited about copperheads and rattlers, too."

Construction crews worked six-day weeks, ten-hour days, in every variety of weather. They were attacked by armies of mosquitoes while crossing

A sheet of water rises 100 feet above the surface of the Susquehanna River after 300 charges of dynamite are set off to clear an underwater ditch for the pipeline.

swamps. They suffered frostbite and sunstroke.

Average depth of the pipe was 30 inches below the surface, which meant that in many places the pipeliners were working with dynamite. Crossing the Susquehanna River, for example, they set off 300 charges simultaneously, sending a sheet of water boiling 100 feet into the air.

In the more populated areas, construction workers faced special problems. They had to duck golf balls while making ditch at the Springhaven Country Club. They had to watch out for aircraft traffic when the line was laid across the Philadelphia International Airport. Crossing the Delaware River they had to stay out of the way of boats and barges on one of the busiest waterways in America.

"We had our share of tough spots," says Tom Shannon, "but they were nothing compared to the trouble we had with people. You know, pipeliners are a pretty funny bunch of guys. But some of these people . . ."

There was one woman who pulled up marking stakes just as fast as the surveying engineers could put them in. When that failed, she sicked her German police dog on the workers.

Another woman protested against plans to dynamite, even though they had been approved by municipal officials. "You light those fuses," she informed the workers, "and I'll jump right in the middle of them." They did, but she didn't.

Sidewalk superintendents of all ages made life more difficult for the pipeliners. Children were constantly seeking to explore the ditch. Men — and women, too—were full of good advice as to the best method of laying a pipe.

"We appreciated their interest," Tom says, "but after all, we had a job to do."

There was one man, a rabbit-breeder, who earned the gratitude of the workers. They accidently set loose a number of his rabbits and were prepared for the worst. But he reassured them. "Still got a set of mates left," he said, "and I figure my stock'll be back to normal in no time."

Dave Purnell is vice president in charge of operations for Laurel. Twenty-five years ago he was a pipeline walker, assigned to hike the length of a line looking for leaks. Today airplanes do the "walking" and Dave works in the world of microwave radio and electronics. His desk is located in the modern glass and steel headquarters of Laurel in Camp Hill, outside Harrisburg, Pa. But his responsibility embraces every man and every inch of the line.

"I'll give you an idea of how complex this thing is," he says. "We run the whole system from here at Camp Hill. But the line itself never gets any closer to us than two miles. Except for radio

Carving a serpentine path across the Allegheny mountains, the Laurel Pipe Line stretches 447 miles from Philadelphia to Cleveland. It is the world's largest-diameter products line.

Pipeliners have a moment to spare to "mug" for the cameraman. But theirs is a rugged occupation. They are always on the move, working in biting cold, pounding rain, blistering heat and in dangerous and often difficult terrain.

limitations and cost, we could just as easily be in New York City."

The cigarettes pile up in his ashtray as Dave Purnell talks about his favorite subject.

The story of Laurel properly starts in Texas, or the Middle East, or Venezuela. Crude oil from all over the world comes to the three refineries which currently use the line. Six major grades of oil products produced at the refineries flow into Laurel pipe at Booth Corner outside Philadelphia.

Booth is the first pump station on the line. Here huge centrifugal pumps, working like pinwheels, give the products enough push to keep them moving through the pipe at two to four miles an hour. There are three other stations spotted along the line.

The different shipments (or "batches") of gasoline, fuel oil and other products move along like cars in a freight train, each batch filling 15 or more miles of line. The difference is, these "cars" are liquid; they can't be kept apart by couplings.

"That's the question everybody asks," says Dave Purnell. "Why don't the batches mix? Of course, the answer is, they do!"

The area of mixture, at the point of contact between two products, is known as the interface. It is held to a minimum by keeping the pipeline always full and under pressure, resulting in so-called "turbulent flow." If the products moved in a smooth flow, the liquid near the center would go faster than that near the pipe wall, and the mixing would be enormous.

Still, there is always an interface, but it is only a fraction of one per cent of a given batch. Pipeliners avoid it at most terminal points by taking delivery from the "heart" of the product as it flows by. At points where the complete product stream is delivered, equipment separates the interface and shuttles it to special tanks, insuring product purity.

The pipeliner's nightmare is set on a mountain top. If the pressure in the line should ever fall sharply, half the shipment would flow down one side, half the other side, and the mixture would be close to total. "We don't even like to think about it," says Dave.

Spaced along the 447-mile pipeline are the 23 oil company terminals which form its reason-for-being. When the shipment for a given terminal arrives there, a valve is opened and the batch or portions of it flow into terminal tanks. Once in those tanks, the product is no longer Laurel's responsibility. It is distributed by the oil company to its gasoline, fuel oil and other wholesalers, who in turn pass it on to service stations and fuel oil dealers.

The remaining products continue their trip, under farms and rivers, over mountains, their ranks thinning as the various terminals along the way take their share, until the western terminus at Cleveland is reached.

The maximum potential capacity of the Laurel line is 396,000 barrels a day. In terms of home fuel oil, that's enough to heat Kansas for a year. And every barrel must be accounted for, monitored and guided along its route. The job is done by a single man—and an array of amazing scientific instruments.

For four hours each day, Ray Schreffler is that man. He sits alone in a huge, immaculate room facing a 52-foot long control board blinking with multi-colored lights. Every so often an automatic typewriter jumps into life beside him. The telephone rings signalling an incoming message on Laurel's line-of-sight microwave radio system. Any problems that may arise are Ray's to solve; during those four hours the entire multi-million dollar pipeline is his responsibility.

"Some people can't take this job," Ray says. "One fellow we had seemed real easy-going, but when he got home he couldn't eat his supper. Things can kind of pile up on a dispatcher."

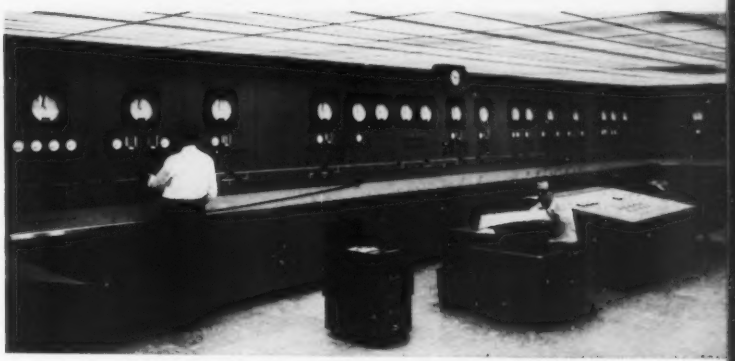
The flow of products through the line is scheduled weeks ahead, based upon requirements of the terminals along the way. But the schedule assumes optimum operating conditions. What happens, for example, when a pump suddenly loses pressure or a delivery valve sticks closed, leaving an extra few thousand barrels in the line?

"Well, that sort of thing changes the whole picture," the dispatcher comments. Any important increase or decrease in pressure or in the quantity of product changes the rate of product flow. That means shipments all the way down the line will arrive at times other than scheduled. It means pump pressures must be revised. It means the inflow of products from the refineries must be corrected to meet the new conditions. Maintenance men must be assigned to correct the mechanical failures. And once the elaborate mathematical calculations have been made to clarify the new situation, terminals must be contacted and informed of the revised schedule.

The Camp Hill dispatch room is the focal point for the entire system. Electronic devices at each terminal determine the type and amount of product being delivered, the pressure and pumping rates, the rate of flow. This "intelligence," as Ray Schreffler calls it, is transmitted to Camp Hill and shows up on the control board in the form of flashing figures and on dials and charts. Maintenance men and terminal personnel and pump station operators report in constantly. Colored lights indicate whether valves and motors are operating properly.

There is a special desk in the dispatch room which is Ray's pride and joy. The surface of the desk is taken up with a floor plan complete with lights, and buttons and switches, which exactly correspond with instruments located 100 miles away in the Duncansville, Pa., pumping station. From his chair Ray can completely control the mechanical operations of the robot, unattended station. He can actually change pump filters when they become clogged, just by pressing a button.

For a veteran pipeliner like Ray Schreffler, or a newcomer like Frank Love, the excitement of a pipeline is in its construction and operation. For



Nerve center of the Laurel Pipe Line is the Camp Hill, Pa., dispatch room. A 52-foot control board, replete with dials, switches and constantly blinking colored lights, operates the pipeline with the precision of a robot.

the nation as a whole, however, there are other considerations.

The huge petroleum pipeline network which includes crude oil carriers as well as product lines such as Laurel, has a direct bearing on the cost of a tankful of gas. Pipelines move petroleum at one-third the cost of any other land transportation system. They share with other industry innovations the credit for keeping gasoline price increases, excluding taxes, down to five per cent during the past decade while the over-all cost of living was rising 21 per cent.

The role of pipelines in national defense is another consideration. The dramatic story of the building of the "Big Inch" line during World War II illustrates this aspect. Axis submarines had cut off the tankers' coastal supply route from the Gulf of Mexico; without the "Big Inch," Eastern defense industries would have been "power-starved."

And the pipelines have made a major contribution to the efficiency of the petroleum industry's distribution system by insuring a steadier flow of products to storage points and consumers.

These benefits have led oilmen to a constant expansion of a system already long enough to circle the globe eight times. Growth is a natural part of the industry's progress. Product pipeline mileage alone has doubled in the past ten years.

Even Laurel, not yet in operation a year, is laying plans for an extension of its system. And the men of Camp Hill are enthusiastic about the idea. Only young Frank Love enters a mild complaint. "I'll never catch up," he grins.

A brawny young pipeliner fastens a steel cable to the nose of a torpedo-like attachment used to pull pipe across rivers where strong currents fight to carry it downstream.

SALT WATER: a liability becomes an asset in the oil fields

by James A. Clark, *Oil Columnist, Houston* Post

America's oil fields annually yield as much as six billion barrels of salt water, the disposal of which represents an unsung triumph in conservation.

Salt water, which comes up from the earth with oil at almost every one of the more than half million oil wells in the U.S., has to be disposed of to prevent the brine from contaminating land and polluting streams.

Fortunately for the nation, the petroleum engineers' principal solution to the salt water disposal problem was itself a conservation measure that has saved millions of barrels of oil that would have been unrecoverable.

Turning a liability into an asset, the engineers devised a method of pumping the otherwise unwelcome salt water back into the underground formation from whence is came to create or maintain pressure that helps drive more oil out of the ground.

This double-barreled conservation measure—known as water flooding—was the result of a long, agonizing effort to outwit nature that began in the East Texas oil field in the late 1930's. A deluge of salt water threatened abandonment of America's greatest oil field and the loss of hundreds of millions of barrels of oil.

When the East Texas field was opened in 1930 the salt water yield was only a trickle. But in a very short time, the trickle turned into a savage flow of brine. The field was producing about 2,000 barrels of salt water from 150 wells in 1932, and just three years later, water "saltier" than the Great Salt Lake in Utah was flowing out of 1,000 wells at the rate of 15,000 barrels a day. Volume reached 100,000 barrels daily by 1937 and soared to 300,000 by 1941.

Oilmen in East Texas, as early as 1935, could see clearly the disaster that was threatening to end the field prematurely. Unless they could control and dispose of the tremendous daily flow of brine, oil production would be doomed in a few years.

The menace was twofold. On one hand, the salt water could not be turned loose, because it was a "killer" water. It contained various chemical compounds that, together with the salt, could destroy vegetation, poison streams and rivers, contaminate fresh water supplies and even wipe out livestock and marine life.

On the other hand, the heavy outflow of salt water was lowering the pressure needed to drive the oil from the oil-bearing formation. Unless the pressure in the water-drive field could be maintained, hundreds of millions of barrels of oil would be rendered unrecoverable.

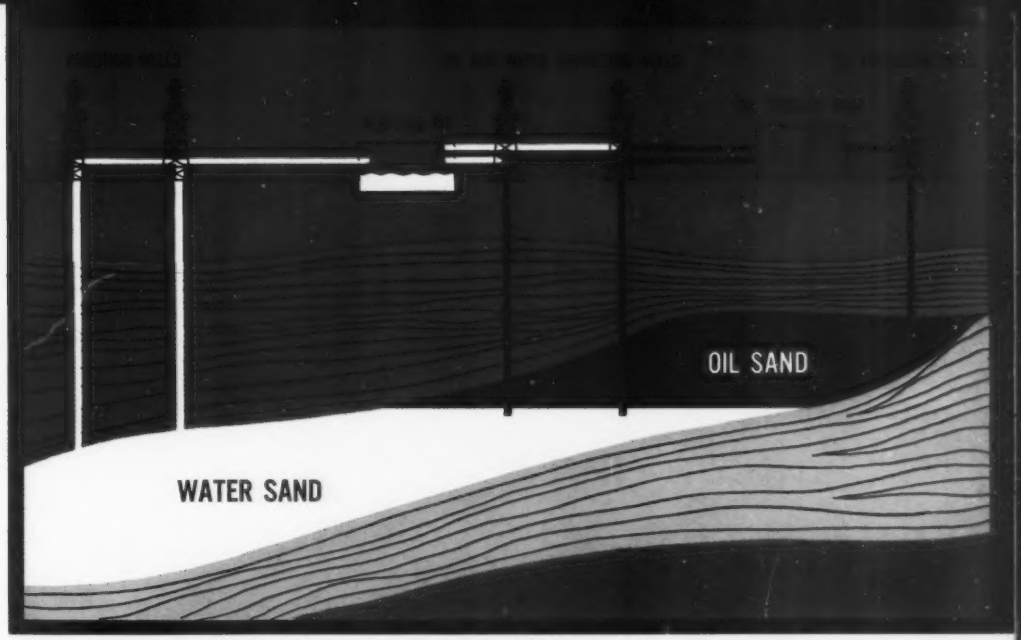
The oil field's best technicians and engineers, meeting with experts of the state government, had plenty of imaginative, if not always practical, proposals to consider.

One young engineer suggested the brine be run into great earthen pits where natural gas flames could be used to evaporate it. However, a more experienced hand nipped that happy thought in the bud with the rejoinder that an even greater problem would be created: the daily disposal of thousands of tons of worthless salt.

A suggestion to build a $30 million pipeline 275 miles south to the Gulf of Mexico, together with a $10 million gathering system in the 42-mile-long field, fell flat, too. For, at the price at which oil was then selling, such a project was not economically feasible.

Considered even more of a gamble was the idea of laying a 72-inch redwood line at a cost of $18 million, plus gathering system. Completely out of the question was a $75 million bitumen-lined concrete canal to the Gulf.

The proposal to try pumping the salt water back into the oil-bearing sands was tabled at first because a previous attempt had failed. The brine had clogged up the sand faces in the formation.



Pressure differentials near the bottom of an oil reservoir and at the top of the water-bearing sands cause water to be sucked into the well bores prematurely along with the oil. At the surface, the oil and water are separated. The oil is fed into storage tanks and the water into aerating pits where it is chemically treated before being injected back into the ground.

However, E. Paul Hubbard, one of the leading East Texas oilmen, contended that the clogging problem could be licked scientifically.

The situation had become desperate, so the East Texas producers agreed to give the injection experiment another try. Hubbard was named chairman of a group assigned to carry out the experiment. One of Hubbard's committee described the project as "Custer's last stand" for East Texas. Either it worked, or the field would have to be written off in a few years.

An experimental injection well was started in 1936, west of the oil-productive limits of the field. It penetrated to the strata of water-bearing sands that underlie the oil-bearing formation. The test well was sunk near an abandoned well that produced only salt water and was located just outside the field's west boundary. Output of salt water was channeled into a 300,000-barrel pit. Over a 61-day period, 381,550 barrels of brine were injected into the test well.

When it was discovered that the flow of injected salt water was being inhibited, it was apparent that the feared clogging of the water-bearing sand strata was taking place. Experts from the industry and from the faculty of the University of Texas were summoned to work on the problem.

The answer seemed to lie in the salt water storage pit, where bacteria in the water were forming a flocculent (minute tufts of wooly matter). Engineers immediately began experimenting with chemical treatment of the water. The result was a treatment that caused the flocculent to settle to the bottom of the pit, letting the salt water flow free of the clogging agent to the injection well.

This achieved, the "last stand" experiment was declared a success. At first, injection wells were drilled by individual producers. But, salt water encroachment was growing to the point where, without concerted action, it could still get out of hand. Thus, in 1942, producers got together and organized the East Texas Salt Water Disposal Company.

The new enterprise purchased existing injection wells and set out to develop a field-wide salt water disposal system, drilling new injection wells as needed, laying gathering lines and adding new chemical treatment and filtration installations. The company collects and disposes of salt water from all producers, large and small.

Today, the field is daily giving up almost half a million barrels of salt water, over three times the volume of oil produced. But, the injection of nearly every gallon of brine helps to maintain the pressure needed to keep the field operating as the nation's Number One producing area.

Virtually all of the country's oil fields have a salt water disposal problem in some degree. In fields where underground formations are such that water flooding is not needed to maintain pressure, injection wells are drilled into porous formations simply to provide a subterranean outlet for the unwanted salt water. And, in some cases where volume is not great, salt water is channeled into the pits and disposed of by evaporation.

Producers spend anywhere from $3,000 to $25,000 to drill an injection well—a well that will never bring in a dime's worth of oil. But, without this investment in conservation both the industry and the public would be denied the benefit of valuable natural resources.

Water flooding, with either salt water or fresh water, has succeeded in extending the lives of oil fields that otherwise would have been abandoned. As a result, billions of barrels of oil have been added to the nation's precious reserves.

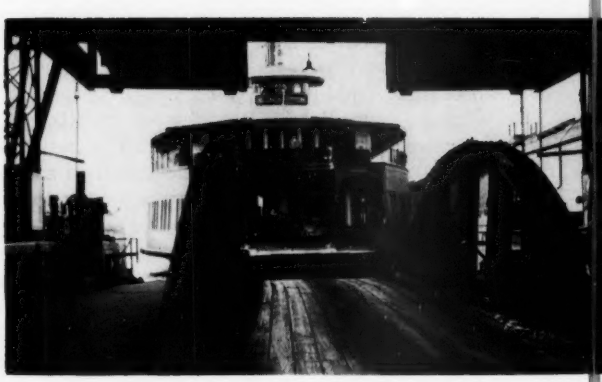
THE WORLD'S BUS

Backdropped by towering skyscrapers and saluted by the Statue of Libe
mile harbor annually handles more than 145 million tons of cargo and

IT is axiomatic to refer to New York as the world's greatest port. But, have you ever tried to conceive of what this means in terms of geographical features, harbor facilities and shipping activity?

Picture what it would be like if you could command all Manhattan skyscrapers to lie down and then order all ships at their piers to rise up on their sterns.

The skyline would be altered but from a distance the pattern would be much the same. There would be great 1,000-foot structures like the *S.S. United States* and the British *Queens*. Another 200 or so steel leviathans would rise from 300 to 1,000 feet above street level. It would be a magnificent image.



Since George Washington's time, ferryboats have been used by commuters in the New York area.

SIEST PORT

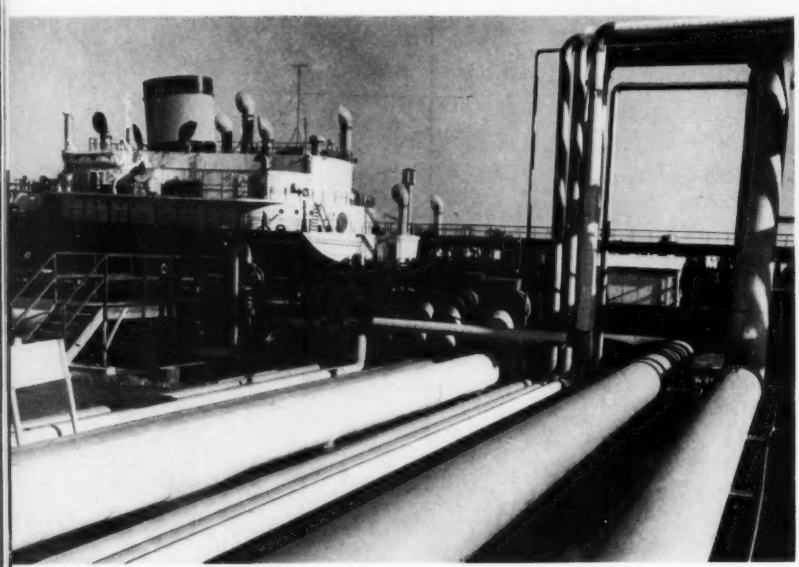
of Liberty, New York's 423-square-
go and nearly a million passengers.

Passenger ships enter and clear the Port of New York at the rate of 700 a year.

The giant 80,000-ton British *Queen Mary* and her sister ship, the *Queen Elizabeth,* use 10,000 tons of fuel on a 6,000-mile round trip—50 tons an hour.

The *Queen Mary,* one of the two largest moving structures ever built by man, carries 2,500 passengers and 1,000 crewmen. As a troop ship she carried as many as 16,000 soldiers on a single crossing.

The Port of New York handled more than 90 million tons of petroleum products last year. Aside from providing fuel for the ships of the world berthed in the harbor, tankers bring in heating oil and gasoline for the metropolitan area.



Modern freighters link the Old World with the New. Last year, 27,260 deep-sea ships owned by 160 steamship lines entered or cleared the port.

The Port of New York, under normal everyday conditions, is itself an almost unbelievable marvel —one that can never be fully appreciated even by the millions of people who get a glimpse of it every day. How could the ferryboat commuter or the kibitzer at a skyscraper window or the stevedore on the docks for that matter get more than a glimpse. For, if New York's waterfront were stretched out, it would reach from the Statue of Liberty to Bermuda.

Just as the city itself is the great melting pot, so the port mirrors all phases of maritime activity. Name virtually any type of craft in general use anywhere and you can see it, or a reasonable facsimile, in the port.

Types of vessels range from car float to luxury liner, from chugging Army driftwood monger to deeply-laden tanker, from mosquito-like water taxi to clean-cut bulk wine or orange juice carrier. The 200 or more ocean-going ships that are in the port on an average day aggregate more than the entire merchant marine of many maritime nations.

The routine plying back and forth of hundreds of tugs, barges, fishing craft, ferry boats, etc., goes on without congestion, so vast are the reaches of the port, encompassing 423 square miles of water area. And through this maze of working craft, day in and day out, one major ocean-going ship enters or leaves the port every 20 minutes.

Americans going abroad on business and pleasure visits account for most of the great passenger flow through the Port of New York. There were nearly a million arrivals and departures last year. More than 70 passenger lines, flying the flags of many nations, use the port.

Through New York comes or goes $4 out of every $10 worth of ocean-borne trade of our entire country. In 1958, for example, this meant that 41.5 million tons of import-export cargo valued at $9 billion passed within the shadow of the Statue of Liberty—the equivalent of $50 worth of goods for each man, woman and child in the U.S.

In addition to ocean-borne commerce, the Port of New York handles about 104 million tons of domestic cargo in a year.

The hundreds of vessels criss-crossing the busy harbor round the clock move by the power supplied by oil fuel. Shut off the supply, and the great port would be paralyzed.

For oil drives the world's merchant fleets today as the winds drove them a century ago. The coal-burning ships left on the high seas are few and far between. Oil fuel takes one-third less space than coal, can be loaded in a few hours as compared to days, and requires fewer men to handle on shipboard.

FRANK BRAYNARD

Pushing railroad-carrying barges is only one of the many workhorse chores of the fleet of 341 tugboats in New York harbor.

One of New York's famous landmarks is the Fulton Fish Market, to which the port's fishing fleets bring the city's daily supply of fish.

New York has more direct sailings by far than any other port, with 85 per cent of the outgoing ships using it as a final loading point. This is one important reason why New York is served by 17 railroads and 140,000 motor trucks.

THE CHRISTOPHER COLUMBUS OF THE OIL FIELDS

by David Griffith

It was spring of 1929 on the farm of Mrs. Daisy Bradford in Rusk County, Texas. The little old man in the wrinkled white shirt and the battered fedora slowly drew a bandana from his hip pocket and wearily mopped his brow. Then, shielding his eyes from the sun, he squinted up at the roughneck struggling with the crown pulley high in the wooden derrick above him.

"How you makin' out?" he demanded.

"Okay," came the reply, "but these parts sure is wore out. Don't know how long they'll stick together."

The old man grunted. "Just one more try," he said. "Just one more try."

Columbus Marion Joiner—known to all as "Dad"—could look back over a lifetime of trying. A lawyer by profession, he had served two years in the Tennessee legislature before moving in 1897 to the Indian Territory, now Oklahoma. There he succumbed to oil fever, and there his bad luck began.

Time and again he drilled, only to miss major fields by the narrowest of margins. Twice he made fortunes. Twice he lost them. And then, after a quarter-century of trying, he moved to East Texas and began trying again.

Rusk County was a sleepy, backwoods region of pine and oaks, cotton and corn. Here barefoot farmers drove razorback hogs down dusty roads just as their fathers and forefathers had done. In this impoverished land a man could lease property for a few dollars an acre and cut his derrick timbers from the stands of scrub pine. In 1922, Dad Joiner was fixin'—as he said—to do just that. He took a five-year lease on a block of some 1,000 acres, cut his timbers and set out to raise capital for a rig and crew.

Already, 17 holes had been drilled in Rusk County, all of them dry. Indeed, geologists had come to the conclusion that the Woodbine sand—the producing formation in the oil fields nearest Dad's lease—was absent in this region. But, these findings failed to dampen Dad's determination to carry on, and later he was to find strong support in Dr. A. D. Lloyd, a geologist who dissented from the judgment of his colleagues.

Still five years were to elapse before Dad could start drilling. During this time his derrick timbers lay unassembled and rotting on the ground and, worse still, his lease expired. Fortunately, he managed to renew the lease so that when he had finally sold enough stock certificates, drilling could get underway in August of 1927. Dad was then 67 years old.

Although the weight of official opinion was against him, Dad was not alone. Rusk County, at least, was on his side. So were all the cotton and truck farmers for miles beyond the borders of Rusk. If Dad could only hit it—and hit it big—they could hope at last for a new industry, a new economy, something better than the back-breaking toil to which the accident of birth and geography had consigned them. His fight was their fight, too.

Whole families came daily to watch and lend encouragement as Dad's crew cut new timbers, raised the derrick and dug the slush pit. Teams of straining mules dragged up wagons bearing a second-hand engine, two rusty, mismated boilers and ugly, sulking mud pumps. At last the fires

Like the intrepid navigator who discovered America, Columbus M. "Dad" Joiner wouldn't listen to those who said it was hopeless to go on drilling in East Texas. After seven years of hardship and at the age of 71, he brought in the well that opened our greatest oil field.

were built, steam was got up, and the ancient engine growled malevolently. Daisy Bradford No. 1 was spudding in.

Six months later—in February 1928—the bit jammed in the hole at 1,098 feet and could not be dislodged. They would have to try again.

First, Dad had to raise more cash. Out he went, peddling his $25 certificates to all who would listen. In April he was back with the necessary capital, and after skidding the rig a hundred feet, spudded in again. By now Dad was 68 years old.

For nearly a year Dad kept his crew straining at the stubborn rock beneath. Time after time he had to put out the fires under his boilers while he scoured the countryside for more investors. Then he would come back, the fires would be lit again and on they would go.

At 1,450 feet Daisy Bradford No. 2 had a show of oil, but when she was tested she became coy and refused to produce. Dad ordered the drilling to go on. Then, in March 1929, at 2,518 feet, the pipe jammed in the hole. Nothing could budge it, and the well had to be abandoned. In this same month Dad turned 69 years old.

When word of the passing of Daisy No. 2 spread through the pine hills, all Rusk County mourned. Many a struggling farmer had a share or two of Dad's stock hopefully hidden away in the drawer of his living-room table or between the pages of his Bible. But outweighing even the threatened loss of this investment was the bitter prospect that now, surely, they would live to the end of their lives with their mud and hogs and serfdom to the soil.

Yet one man—Dad—refused to give in. Instead he went to Houston, talked some more people into buying interests and hired himself a new driller, Ed C. Laster.

"I can't pay you full in cash," he told his new man, simply. "You'll have to take part out in shares."

Laster's admiration for the old man's courage overcame his business sense.

"I'm on," he answered.

It was May when they spudded in Daisy Bradford No. 3, halfway between Daisies No. 1 and No. 2. Cash often was so short that Dad could only work the well on Sundays, so that prospective investors who drove out to the location would find the rig running. When money ran out completely, he paid the grocer in scrip in order to feed his crew. When his men walked off the job in disgust, neighboring farmers and even a local banker pitched in to work as roustabouts.

Eight months later, in January 1930, everything turned black again. Dad was stone broke. There was nothing else to do but shut down the well. Once again he hit the road, pleading with every tycoon, cop and waitress he saw. This time, however, his task was almost impossible. Crops had failed, and in October the Great Depression had struck. And yet somehow, with the first blush of spring, Dad reappeared with a few more dollars. Daisy Bradford No. 3 began chugging again. Dad now was 70 years old.

A rock core from Daisy No. 3 was sent to a paleontologist in Dallas. The diagnosis: no chance whatsoever. Even if you do hit the Woodbine sand it will be dry in this area. "What next?" asked Laster. "Keep her turning," answered Dad. Then he set out for Dallas himself—to sell more certificates.

The crops had failed again and the Depression was tightening its grip. In and about Rusk County it became a pastime to come and watch Daisy No. 3's progress. Farm wives spread picnic lunches, and while their children played in the shadow of the derrick, the men squatted on an old rail fence, munching sandwiches and silently watching.

Early in September, at a depth of 3,536 feet, Laster took another rock sample, and the rumor spread that he had found a show of oil. For a month the well was shut down, while stories of an impending strike flew over the countryside. The test

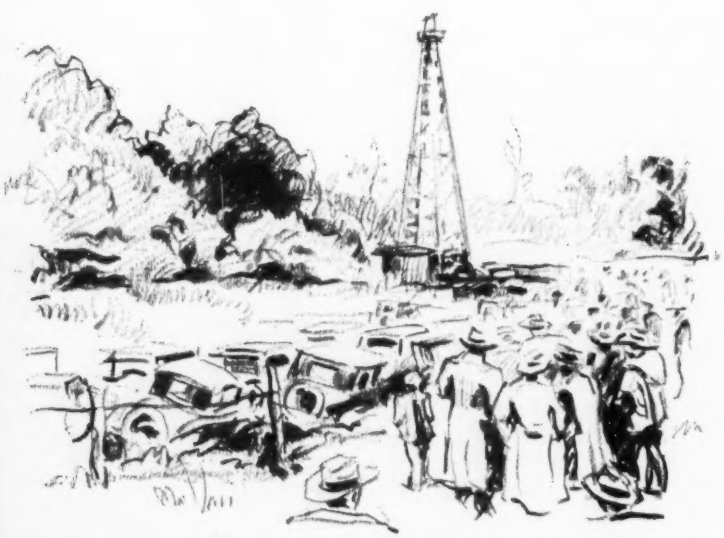
had shown that the drill had reached the Woodbine sand, and when operations were resumed on October 2, five to six thousand people gathered on the Bradford farm to watch the drama—their own drama. Gay, laughing, they choked the roads with their horses, wagons and tired old jitneys. Men peddled nickel pop, dime hamburgers and corn liquor for what they could get. Yet despite the carnival atmosphere, the air was tense.

Hour by hour the bailer was lowered, raised, the mud dumped out, then lowered again. But—no oil. At dusk some of the crowd went home. Others bedded down on the spot—for them the excitement was too great.

The following day the crowd continued to watch as Laster and the crew struggled to get the flow started. Once again—nothing. At nightfall most of the disappointed watchers dispersed, but the men on the rig kept working.

Then it happened. Laster heard a glopping sound, then a gurgle, then a gush. "Put out the fires!" he shouted to the man nearest the boilers. Moments later a stream of oil shot over the top of the 112-foot derrick. Laster put his hand on Dad's shoulder. "We've done it," he said. The few watchers still on hand cheered, threw their hats in the air, slapped Dad and Laster on the back. Dad turned white and Laster thought he was going to collapse. He put him to bed, and the next day sent him to a Dallas hotel to rest. After all, as he said, Dad was nearing 71.

In its first 24 hours, Daisy Bradford No. 3 produced 226 barrels—a relatively modest flow.



But Dad had discovered far more than just another well. Overnight, it seemed, everyone in East Texas was buying and selling leases. Within 12 days more than 2,000 transactions were recorded. Land values soared. On the highway near Dad's well a whole town—appropriately named Joinerville—was staked out. Derricks began to rise for miles around. All East Texas held its breath. Was Daisy Bradford No. 3 a freak—or the harbinger of prosperity beyond the wildest imagination?

Then, on Thanksgiving Day, three-quarters of a mile west of Dad's discovery, Ashby No. 1 came in strong. It was followed on December 2 by Frederick No. 1, 600 feet north of Daisy Bradford. And 12 miles north and 26 days later, mighty Lou Della Crim No. 1 erased all doubts about East Texas by roaring in at an estimated rate of 22,000 barrels a day.

That did it.

Dad's discovery had led to the opening of the largest oil field in the world up to that time—and still the largest in the United States. It is 43 miles long and from three to 12 miles wide. In its 29-year history, 30,000 wells have been drilled, producing almost 3.4 *billion* barrels of crude. Nearly 20,000 wells still are operating, and it is estimated that it will take another 38 years at the 1958 level of production to produce the 1.76 *billion* barrels that geologists believe will be recovered ultimately.

The barefoot farmers driving their razorback hogs had once dreamed of oil in the hope of paying off their debts. Instead, Dad's discovery completely changed their lives. It gave them a vast stake in a vital, pulsating industry, lifted them out of the mud, brought them modern roads, homes and schools. Overnight, East Texas was transported from the lowering shadows of the 19th Century to the noonday radiance of the 20th.

And Dad? Back in bed in his hotel room in Dallas, the old man could not visualize the vast new era his courage and tenacity had made possible. All he knew was that his telephone jangled ceaselessly, each new voice threatening a new lawsuit. By now, his fantastic maze of financing and refinancing was hopelessly tangled. In desperation, Dad went into receivership, and a month later sold out his interests for approximately $1,250,000.

On March 27, 1947, the old man died at the age of 87. He was broke—legal battles and dry holes had taken all that he had made. But to the end Dad possessed one thing that no one could take from him—the knowledge that he had brought in the mightiest oil field in the world.

Nature's 'Atomic Clock' aids oilmen and archeologists

by Eliot Tozer

A RAILROAD engineer and an advertising executive were poking through the rubble of an ancient campfire near Dallas, Texas, not so long ago when they uncovered a spear point. It was not much to look at—small, stained and crudely shaped. But the two men, members of the Dallas Archeological Society, recognized their find as a "Clovis point," a spearhead pounded out of flint by a primitive tribesman thousands of years ago.

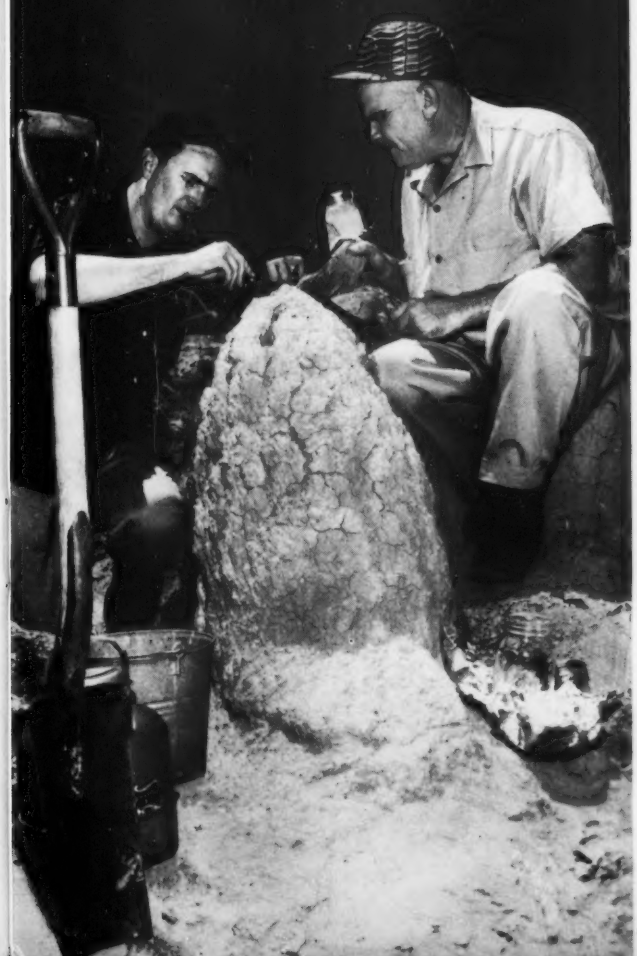
The excitement of the two "Sunday scientists," R. K. Harris, the railroader, and Wilson W. Crook, Jr., the advertising man, was quite justified. Clovis Man was one of the earliest inhabitants of America. Anthropologists had determined, as best they could, his time on earth as at least 15,000 years ago. But, their judgment was still open to question.

In the hope that they could throw new light on the mystery, the two amateur archeologists gathered up some pieces of charcoal from the fire pit where they had found the spear point, as well as some animal bone fragments from nearby. But they didn't go to a library or a museum to check the age of their spear point find. They went instead to the research center of an oil company in Houston.

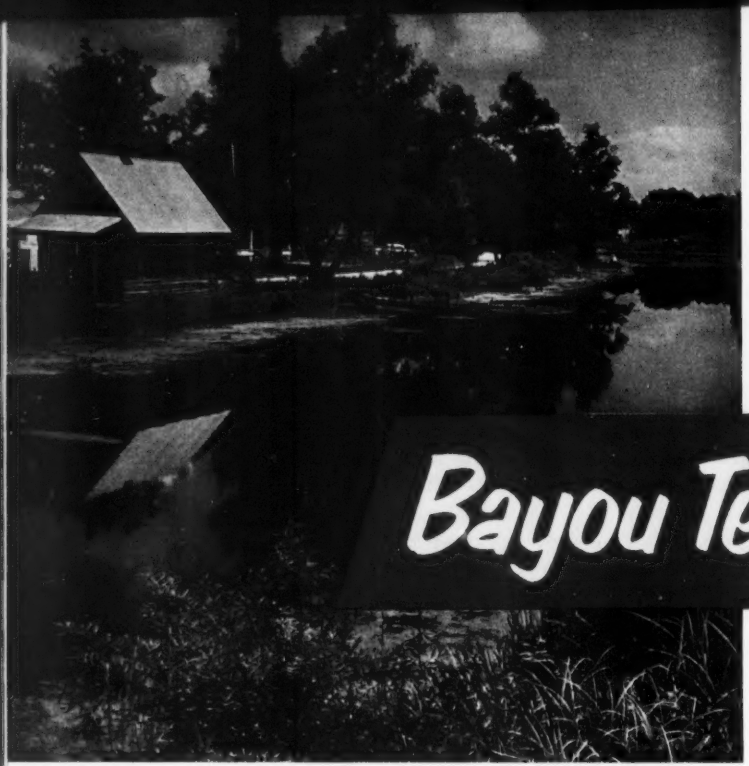
The company gets hundreds of requests every year for assistance in dating odd materials—far more than it can handle. But this looked like a real "find." Slowly, and very carefully, a sample of charcoal was prepared for testing with a new kind of laboratory equipment that can tell the age of almost any material by counting the atomic "explosions" taking place within it. The technique, perfected during World War II by former Atomic Energy Commissioner Willard F. Libby, is called radiocarbon dating

Two days later, the Sunday scientists were surprised to learn that the bone fragments were those of animals long-since extinct in Texas—camels and elephants. They were even more astonished at the results of the charcoal tests. The charcoal from the campfire was 37,000 years old, far older than any other trace of human life found in the New World! Apparently, some sort of huntsman roamed the American Southwest thousands of years before paleolithic man scratched his pictures in the caves of France.

In the early 1950's, all kinds of scientists had turned eagerly to Dr. Libby's new technique.



"Sunday scientists" Wilson W. Crook, Jr., advertising executive (left), and R. K. Harris, railroad engineer (right), discovered a 37,000-year-old camp site near Dallas, Texas.



Oil Country U.S.A.

(second in series)

Bayou Teche Revisited

by George N. Hebert

Shacks along the bayous are reminders of southern Louisiana's storied past. The oil derricks that now dot the picturesque countryside have become symbols of a new and more prosperous era.

MORE than 15 years ago, when I'd last passed this way, a weathered sign lured travelers along Highway 90 with the words FRENCH FOOD. Now I noticed that the clapboard exterior had been overlaid with brick and the oyster-shell parking area had been paved.

Inside, air-conditioning units quietly cooled the booths and tables. Fancy light fixtures had been installed where before ceiling fans had hung. Only the menu retained something of the past. It still listed shrimp remoulade, crayfish bisque, crayfish etouffe, courtboullion, fried catfish, fried fresh frog legs and oysters in a dozen different guises. Steaks were priced disdainfully low. And why not? Who would dream of eating anything so ordinary as steak when faced with a selection of delicacies found only in this Cajun country and prepared as only these cooks could prepare them? Who indeed?

I asked in the French *patois* of the countryside and the answer, proudly given in dialectically spiced English, forced recognition of the bayou country as it is today and will be tomorrow.

"*They* order steak. Most have no time for the sampling of good Creole cooking. They eat what they know and go quick on their way," the petite dark-eyed waitress told me as she pointed to *they*.

On the wall, just inside the door, was a huge bulletin board affair. A stenciled legend read: "Oil Patch Information." Stuck to the board with thumbtacks were several hundred business cards posted by people from every branch of the oil business. There were marine specialists, mud salesmen, surveying services, tool company representatives, drilling contractors, landmen, independent brokers, shipbuilding concerns, industrial photographers, helicopter and sea plane establishments, truck rental agencies, steel companies, lumber companies, plastics companies, specialty companies and many others. The cards had been posted, I was informed, to serve as an introduction to other oilmen stopping for refreshment. There are other such boards, the waitress told me, in other establishments along the Old Spanish Trail traversing the coastal parishes from New Orleans to the Texas line.

Through the broad front window pane I had an unobstructed view of yesterday. Across the highway aged oaks washed their beards of Spanish moss in the shadowy waters of Bayou Teche.

The cluster of cards at first aroused in me a feeling of regret over the passing of an unforgettable era. But, on second thought, and more realistically, I saw them as a preface to a chronicle more fabulous than the one which has gone before.

The dawn of Louisiana's petroleum era came on

September 21, 1901, when the state's first oil field was opened in Acadia Parish. Since that time billions of dollars have been invested in finding and developing new oil and gas supplies. In a typical year drilling and equipment costs alone have amounted to more than $660 million, with another estimated $125 million going into payments for leasing state and private lands.

Drilling costs in Louisiana average $21.31 per foot as compared with the national average of $12.35. Offshore operations in the Louisiana portion of the Gulf of Mexico, where drilling costs average $42.89 per foot, are primarily responsible for this wide gap. But even onshore wells, due to difficult terrain and necessity of drilling progressively deeper to reach oil, are averaging $19.99 per foot.

Heavy investments in exploration added 3.54 billion barrels to the state's oil reserve in the years 1952 through 1958 alone and added 38.41 trillion cubic feet to natural gas reserves during the same period.

Today Louisiana is the nation's second ranking state in reserves. As of December 31, 1958, proved oil reserves totaled 4,043,993,000 barrels; proved gas reserves 55.1 trillion cubic feet, and gas liquid reserves 1.2 billion barrels.

"Roughnecks"' working on a portable drilling rig prepare to position a length of pipe in a well located in southern Louisiana bayou country. This region accounts for 65 per cent of the state's crude oil production.

Swamp gas spouts from a hole drilled in southern Louisiana by a seismographic party searching for a formation that might contain oil. A swamp buggy is in the background.

The South Louisiana bayou country accounts for 65 per cent of the state's crude oil production. Offshore operations bring in 21 per cent and fields in North Louisiana another 14 per cent.

THE "old days" are gone. Sitting there, in the restaurant, one could see the sunspots, filtered through the oaks, spread across the surface of the stream on the other side of the road.

The Teche is possibly the most famed of Louisiana's many bayous. With an occasional assist from generations of men it has kept to the confines of the same high, sloping banks and has followed the same serpentine path it etched eons ago when it was the earliest Mississippi River course, until it was deserted by the Father of Waters in 900 A.D.

The Teche winds its way 125 miles through Evangeline country from Bayou Courtableau to Morgan City where it joins the Atchafalaya River.

It is a mirror of the past in the frame of the future.

Its waters have reflected the cannibalistic rites of the Attakapas Indians, the tempestuous deeds of wealthy French aristocrats, the passage of Spanish

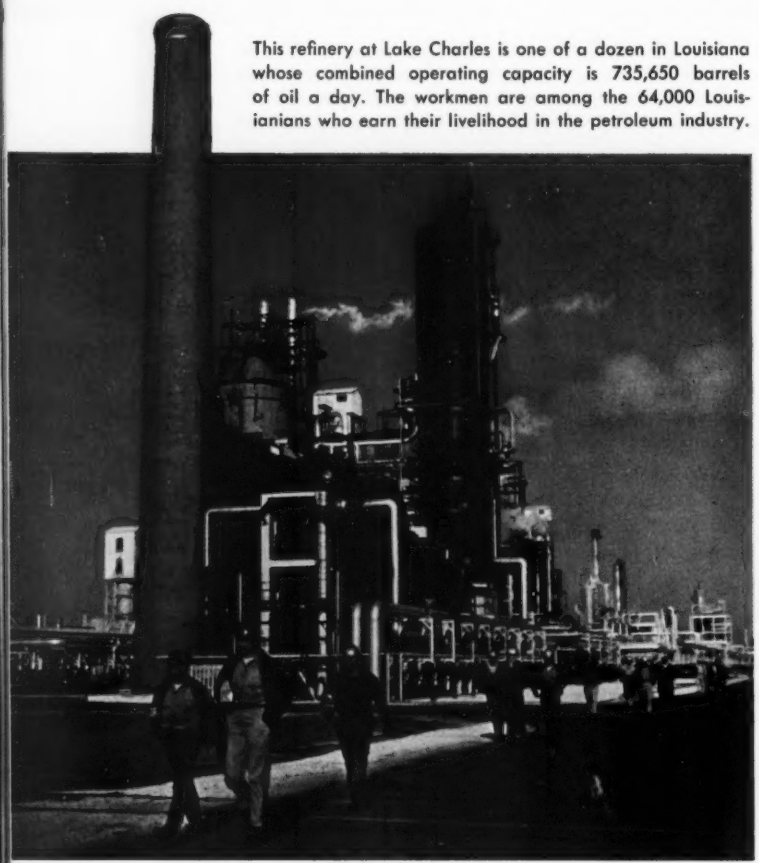
grandees and the flaming torches of Creole revelers.

The old plantations along the bayou banks, the shacks built out into the marshes, the harness shop, the smithy, the gingerbread public buildings—the tarnished filigreed "frame" of yesteryear is gone.

The derricks rising from the picturesque countryside are a welcome new feature on the landscape. For, they are recognized as pillars of a major segment of the state's economy.

Some 64,000 Louisianians earn their livelihood in the petroleum industry, accounting for 17 per cent of the state's industrial and commercial payroll. And there are 80,000 landowners who collect lease rental or royalty dollars from prospecting and producing operations.

Legislators, on behalf of their constituents and with an eye to the tourist trade, have preserved and enshrined much of Old Louisiana. This is done with tax money of which the oil industry is the biggest contributor. Indeed, more than half the money from Louisiana sources to be spent by the state during the 1959-1960 year will come from oil and gas. Through taxes and various fees at all levels of its operations, the oil and gas industry will provide an estimated $316 million of the $615 million collected within the state.



This refinery at Lake Charles is one of a dozen in Louisiana whose combined operating capacity is 735,650 barrels of oil a day. The workmen are among the 64,000 Louisianians who earn their livelihood in the petroleum industry.

The Louisiana severance tax will produce approximately $120 million for public education, 61.5 per cent of all state funds for this purpose. The oil and gas industry alone pays more than half the total cost, state and local, of operating Louisiana's public schools.

The schools reciprocate.

Education in Louisiana has been oriented to the oil industry in several ways. A vigorous adult education program makes it possible for those who did not finish high school to take study courses on an accelerated schedule. There are 24 state-operated vocational schools whose specific purpose is to train people to fit the requirements of the new industries. Most of the wide range of courses are taught for the benefit of men and women preparing for careers in oil. One institution, Sowela Vocational and Technical School in Lake Charles, teaches oil-well drilling and uses an exact scale model of a marsh (pontoon floated) drilling rig and all its tools and equipment to prepare young men for lucrative positions on a real drilling rig floor.

SOWELA'S choice of rig styles was not a random one. The marshlands around Lake Charles, indeed throughout South Louisiana, have yielded tremendous amounts of crude oil. The pontoon rig, the board road, long hot days and lonely nights made lonelier by the weird callings of the night birds and swamp animals are all part of the oil patch and the experience of a special breed of American workman who thrives on hardship . . . the oilman.

Water not only covers the oil-rich swamps, it also serves as one of the prime means of transportation. There are more than 5,000 miles of navigable waterways in Louisiana. There are three major deepwater ports. Two of these, New Orleans and Baton Rouge, in 1958, reported that almost 55 per cent of their total volume of freight consisted of crude oil and petroleum products.

At Lake Charles, the third major port, petroleum accounted for 82 per cent of the cargo handled in 1958. Fortunately, this community back in the early 1920's had financed the dredging of a deepwater channel to the Gulf.

Drilling and equipment costs in the Louisiana oil fields have amounted as much as $650 million a year. Hundreds of enterprises, varying from pipe suppliers to surveying services, owe their existence to the oil industry.

Along the banks of this same channel are located oil refineries and chemical plants which have brought industrialization to what might have been a second-rate agricultural center.

From Lake Charles to New Orleans, across the southern part of the state, are located most of the twelve active Louisiana oil refineries with an operating capacity of 735,650 barrels per day. During 1958, these plants received a total of 229,121,000 barrels of oil. Of this amount 90,802,000 barrels were delivered by pipelines from Louisiana fields; tank cars and trucks brought in 1,217,000 barrels; boats and barges handled 66,944,000 barrels. The balance was out-of-state shipments.

IT was time to go. Outside the restaurant the sun beat down on the parking area and Highway 90. Across the road Bayou Teche flaunted its decorations of oak leaves, wisps of moss and driftwood. I recalled Robert Flaherty's Academy Award winning production. It was here in South Louisiana along the Teche that the master lensman found the ideal location for filming the movie titled, "The Louisiana Story." I remembered that Virgil Thompson, composer of the movie's musical score, had won a Pulitzer Prize for his composition. Thompson had merged the sounds of oil production with the haunting tones suggested by the bayou country and his work had won lasting recognition.

I stepped outside, looked down the highway toward the west, along the way I'd traveled, and thought of the trip in terms that Thompson might have used.

The sound of Bayou Teche industrial development remains *forte* after leaving the petroleum precincts of Iberia Parish. It continues thusly, along the stream, most of the way through St. Mary Parish. At times it is *diminuendo* and even fades into *pianissimo* along some sections of The Old Spanish Trail with the sweet, sad notes of the cane cutter's song just outside Franklin and the vibrant humming of the moss pickers in Garden City and Verdunville. Along the main street of Patterson, stretching for one mile along the bayou, the volume picks up again. New sounds are heard: the clatter of a rivet gun in the shipbuilder's shop, the hiss of a torch as welders cut patterns for the steel-clad crew boats built there. Louder and louder become the sounds of industry and they reach *crescendo* in Berwick and Morgan City occupying opposite banks of the Atchafalaya River near the point where it swallows the Teche.

Here all traces of the past have been replaced. The oil industry is in full swing. Along Highway 90 for miles on either side of the towns' limits are bustling service and equipment companies, all with little time for legend. Theirs is the responsibility for helping supply the urgent need of a modern nation for all the practical products to be found in a barrel of crude oil.

Ten miles and 200 years away Bayou Teche flows unobtrusively into the busy waters of the Atchafalaya. This is the end of the line. Although the gentler, older Teche and its lore are not far off they seem worlds apart from this place.

"Still stands the forest primeval; but under the shade of its branches
Dwells another race, with other customs and language."

Education in Louisiana has been oriented to the oil industry in several ways. One vocational school teaches oil-well drilling, using a scale model of a pontoon-floated drilling rig.

Your gasoline dresses for the weather

by Bruce Quayle

SHERLOCK HOLMES would have reveled in today's gasoline.

You can almost hear him say: "Elementary, my dear Watson, the victim could not possibly have driven from Florida to New York. He has 'Vermont weather' gasoline in his car."

Yes, for a man as handy with a test tube as Holmes was, it would be a simple matter to determine from an analysis of today's gasoline what the season was like when the fuel was bought and even the probable locale of the purchase.

Everything is "strictly elementary" once you know the facts, Holmes was fond of reminding Dr. Watson. And, the facts are that gasoline is tailor-made for the location *where* and the season *when* it is to be sold. In other words, gasoline is weatherized. A tank-full bought today in wintry Chicago will be different in several ways from a tank-full of the same brand purchased in balmy Miami. And next summer's gasoline in Chicago will be unlike the winter fuel.

Probably very few motorists are aware that these changes in gasoline characteristics are being made, so smoothly do the nation's refineries shift production from season to season. Whether it is Los Angeles this week or Montana the next, your car can be expected to start easily, accelerate smoothly and deliver a goodly number of miles.

To achieve this, a sizable portion of the $300 million which the oil industry invests annually in research goes into intensive and continuing fuel testing in all varieties of weather and terrain. Winters in Adirondack snow and summers in Mojave desert sun are an old story to researchers.

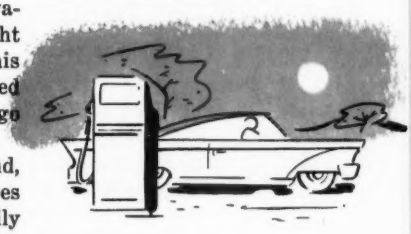
But why must gasoline have such a chameleon-like nature? Well, before it can power your car, the gasoline in your tank must be changed into a burnable vapor. This is done by the process of carburization, which may be compared to evaporation. The vapors of the air-gasoline mixture are collected, and fed into the cylinders for burning.

It is the problem of evaporation—changing gasoline from liquid to vapor—that prompts most of the variations in gasoline from place to place and season to season.

Just as the family wash will dry quickly when the day is sunny and then hang damp for hours when it's cloudy and humid, so does the nature of gasoline evaporation vary with weather conditions.

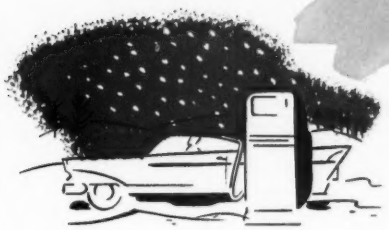
But so well do oil researchers and refiners adjust their product to these varying conditions that the motorist seldom is aware of the problems. And the problems often are conflicting.

Gasolines which vaporize too readily may boil or percolate in the fuel line or the carburetor, reducing the flow of fuel to the engine. This causes uneven operation or perhaps complete stalling due to what is called "vapor lock." You might have experienced this with an overheated engine in stop and go traffic.



On the other hand, gasoline which does not vaporize readily enough may cause hard starting, poor warm-up and acceleration, and unequal distribution of fuel to individual cylinders. It wastes gasoline and cuts down your mileage.

The dilemma on which these prickly horns are found is the characteristic of gasoline called volatility—the manner in which a liquid vaporizes. Highly volatile fuels that vaporize readily are good at some times, bad at others; good in some places, bad in others. It's the same for low volatility.



With the constant advances in engine design and with changes in motoring habits, the problems of volatility have increased with the years. More powerful engines develop higher operating temperatures, raising the "vapor lock" threat more often. At the same time, the need to raise continually the anti-knock quality of gasolines for high compression engines has narrowed the range of petroleum stocks that can be blended into gasolines and thereby has increased the volatility control problem.

With all these opposing pressures, what does a refiner do?

The complete answer to this—or rather the search for the complete answer—has filled hundreds of speeches and technical papers prepared by automotive and petroleum engineers. The thousands of research dollars and experimental hours represented by these papers have been boiled down into an acceptable table of standards which demonstrates the ends to which refiners go to insure trouble-free auto operation.

The standards divide the year into three periods: summer, winter and spring-fall, and set a maximum volatility for each period. They divide the country into four climatic sections, for each of which is prescribed *on a month by month basis* the fuel with the most suitable volatility.

In section 1—the coldest—highest volatility or winter fuel is recommended for three months of the year and, depending on the long-range weather forecasts, suggested for two others. Thus, the refiners like the fuel oil marketers and manufacturers also must take an interest in the predictions of meteorologists, the *Farmer's Almanac* and the little wooly bears.

In section 4—the warmest—the highest volatility of fuel is never recommended, and only the middle volatility is necessary even in the colder months of December and January.

Indicative of the depth of these volatility requirement studies is the fact that three states—Arizona, New Mexico and Texas—are split between two sections because of the different conditions prevailing above and below the 33rd parallel in this area. In certain sections, too, where the weather becomes exceedingly hot in summer or the altitude is high, further refinements of summer volatility are suggested.

Within these maximum standards and geographic regions, gasoline refiners have learned to make such variations as might be necessary, giving distinctive qualities to the fuels sold in each region.

Testing gasolines to insure proper volatility is a most exacting and complicated procedure. In brief, it involves determining first the vapor pressure of the given sample in a test apparatus the oilmen call a "bomb." Then the sample is put through a distillation test to determine the amount of the gasoline that will vaporize readily at various engine temperatures.

Today's exacting examinations contrast with a 1912-vintage test described recently by one of the industry's leaders:

"Today, petroleum technologists have many scientific tests for measuring volatility as well as other qualities of gasoline. When I was a young man, we weren't quite so scientific, and I claim some credit for devising a simple testing procedure which worked pretty well for 'gas machine' gasoline from condensation of water vapors in the air, gasoline out of a second-story window of the laboratory. If enough of it reached the ground in liquid form to make a spot on the sidewalk, the gasoline wasn't volatile enough. I called this the 'Second Story Test'. We used to designate gasoline

SCHEDULE FOR GEOGRAPHICAL SEASONAL VARIATIONS

W = Winter type gasoline
S-F = Spring-Fall type gasoline
S = Summer type gasoline

TERRITORY			MONTH										
			JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
SECTION 1														
IDAHO IOWA MAINE MICHIGAN	MINNESOTA MONTANA NEW HAMPSHIRE NORTH DAKOTA	SOUTH DAKOTA VERMONT WISCONSIN WYOMING	W	W	W OR S-F	S-F	S-F OR S	S	S	S	S OR S-F	S-F	S-F OR W	W
SECTION 2														
COLORADO CONNECTICUT DELAWARE DISTRICT OF COLUMBIA ILLINOIS INDIANA KANSAS	KENTUCKY MARYLAND MASSACHUSETTS MISSOURI NEBRASKA NEVADA NEW JERSEY NEW YORK	OHIO OREGON PENNSYLVANIA RHODE ISLAND UTAH VIRGINIA WASHINGTON WEST VIRGINIA	W	W OR S-F	W OR S-F	S-F OR S	S-F OR S	S	S	S	S OR S-F	S-F	S-F OR W	S-F OR W
SECTION 3														
ALABAMA ARIZONA* ARKANSAS CALIFORNIA	GEORGIA MISSISSIPPI NEW MEXICO* NORTH CAROLINA	OKLAHOMA SOUTH CAROLINA TENNESSEE TEXAS*	W	W OR S-F	S-F OR S	S-F OR S	S	S	S	S	S	S OR S-F	S-F	S-F OR W
SECTION 4														
ARIZONA† FLORIDA	LOUISIANA NEW MEXICO	TEXAS†	S-F	S-F OR S	S-F OR S	S	S	S	S	S	S	S OR S-F	S OR S-F	S-F

*North of 33 deg latitude. †South of 33 deg latitude.

(Chart based on information from the American Society for Testing Materials.)

of high volatility as 'high test'. Today the term means something else."

At least one weather-produced volatility problem permits a fairly easy solution. This is carburetor icing, which is caused by the cooling effect of rapidly evaporating gasoline. At certain conditions of humidity, this sudden cooling will freeze the water vapor in the air and clog up the carburetor, causing stalling. Industry tests have charted nationwide the local seasonal conditions conducive to such icing, and oilmen know when and where they must take steps. Such steps nowadays usually consist of adding minute amounts of a special anti-icing agent to the gasoline.

An additive also has been found to solve the winter problem of the moisture that gets into gasoline from condensation of water vapors in the air, in storage and fuel tanks. If this moisture freezes in the wrong place—like a fuel line—your car is out of business. An additive at the right time takes care of this.

Not only vapor pressure, boiling points and the presence of additives could give Sherlock Holmes —or any gasoline analyst—clues in our gasoline samples. An automobile's octane needs, its tendency to knock, also are affected by weather and geographic conditions, so that octane ratings of gasoline must vary from region to region.

It has been estimated by one oilman that for each thousand feet increase in elevation above sea level, the anti-knock requirements of an automobile drop about two octane numbers. Regular surveys of gasoline on the market show that in such cities as mile-high Denver and Salt Lake City, the octane ratings generally are lower than in most other cities.

Likewise, high humidity lowers the octane requirements of a car's engine, a factor which is taken into consideration in blending fuel for certain areas.

Fuel researchers have even determined how much tail winds raise and head winds lower octane requirements.

Research into the best means of fueling automobiles is a never-ending assignment and challenge to petroleum scientists.

Printed in U.S.A.

ZOO-OIL-OGY

Originality of speech is one of the distinctive characteristics of men who devote their lives to the oil fields. They even have their own terms for common, everyday objects. Names of animals, birds and insects crop up repeatedly in workaday language. Here are some examples:

Mockingbird
Squeak in the engine.

Alligator
Wrench with long jaws.

Monkey
Crew member who works high in the derrick.

Pig
A scraper that squeals as it is pushed through pipelines to clean them.

Rock Hound
Geologist.

Elephant
A powerful pumping unit.

Hoot Owl
The work shift from midnight to 8 a.m.

Snake
Device for threading and pulling a cable through small openings.

Boll Weevil
Greenhorn on a drilling crew.

Donkey
A stubborn engine.

Bear Cat
A well that produces great quantities of oil.

Buffalo
Amphibious tractor for laying pipe in shallow waters or marshes.

Wildcat
Well drilled in a region where no oil has ever been found.

Spider
Web of pipes or wire.